Spring habitat selection of sables in Daxing'an Mountains

Zhang Honghai (张洪海)[1]

College of Wildlife Resources, Northeast Forestry University , Harbin 150040, P. R. China

Abstract This paper studies the habitat selection of sables ((*Martes. zibellina*) in spring adopting radio- tracking and GPS(Global Positioning System) in Daxing'an Mountains of China. Sables liked mature and elder forest, but it avoided uncovered and young growth land. In spring sables had strong selection to medium cover-degree forest, but it avoided widen ground and especial high cover-degree forest. On the contrary sables didn't have the strong selection to shrubs cover-degree, but strong selection to dominant tree species, slope degree and slope direction, especially sable liked medium and lower slope. At the same time, sables had the strong selection to the log's density and the crown's cover-degree. Generally it avoided high elevation and lower slope land.

Key words: Sable, Radio-tracking, GPS, Habitat Selection, Daxing'an Mountains

Introduction

Sables (*Martes. zibellina*), rare fur-bearing animal, belonged to carnivore, and scattered in North-Asia continent and its island, such as: Russia Mongolia and Korea, etc. There were four subspecies in Northeast and Xinjiang of China: *M. Z. princeps*, Birula, *M. Z. Linkouensis* Ma Et Wu, *M. Z. hamenensis*. Kiskida and *M. Z. altaica* (Ma 1981).

Sables, as a typical animal of sub-frigid zone coniferous trees, was known as one of three treasures in Northeast for its fur. Now, it was looked as the first class protected animal in our country. Our sable was mainly in Daxing'an Mountains and Altai Mountain where were typical snow-forest climate and in the north of 41°N (Tong 1981, 1990, 1995; Gao 1987), Elevation ranged from 1 000 to 2 000 m. Near sea, there were rich in animals and vegetation for its humid and pleasantly cool air. So many mammals (field vole, wild mouse, squirrel, hare) and birds (hazel grouse, caper caillie) were significant to the live of sables (Ma 1986; Gao 1987).

In this paper, we studied the habitat selection of sables by radio-tracking and GPS in spring in Daxing'an Mountain of China.

Study area

This research's field work place was set up in the virgin forest of Aba river valley, north bank of Mangui Forest Bureau, in the north of Daxing'an Mountains Geographical position is 121°31'-121°51' E, 52°05'-52°20' N.

Landform of this area was lower mountain and plain where had perfectly round top, gentle slope and wide river valley. Elevation ranged from 1000 km to 1500 km and there was no accumulated snow. The spot of this research lied in a tributary of rapids, Aba river upstream which is the part of Erguna River System and had dense network, obvious bend and rapid current velocity.

This area belonged to frigid and temperate zone continental climate. So it is the coldest in our country. Influenced by forest climate of Daxing'an Mountains and cold air from Siberia plateau, cold winter was very long whereas summer was short. Half of a year there was in ice, snow and severe cold. Average temperature was between –4°C~6°C and the maximum and minimum respectively were over 35℃ and below -40℃. Frost-free period amounted to 80~100 d. Between the last ten days of September and the middle ten days of next April, This area was in freeze season for two hundred days. *Larix gmelini* was dominant species. With elevation varied from high to low, plant community differently existed *Pinus pumila*-larch sparse woods, *Ledum palustre*-larch, *Rhodo dendrondauricum*-larch. There was some tree species such as: *Pinus pumila, Betula platyphylla, Pinus Sylvestris* under the tree mainly were *Rhodo dendrondauricum, Vaccinium viris-idaca, Ledum palustre* were the representative species of herbs.

Fauna belongs to eastern. Daxing'an Mountain subregion in northeast. Being rich in birds and beasts resources, this area was scattered so many ones such as *Alces alces, Cervus elaphus, Lynx lynx, Ursus arctos, Gulo gulo, Martes. Zibellina, Lepus timidus.*

[1]Present address: Department of Biology, Qufu Normal University, Qufu, Shandong 273165, P. R. China

Received: 1998-10-15

Responsible editor: Chai Ruihai

Study methods

Radio-tracking and GPS was adopted in this research. Radio-tracking made use of radio-telemetric instrument which included two parts: launching parts which often was put on the animals by collars weighing 25 g or others. Launching frequency we used was 164 Hz and the battery's life span was over six months. Receiving ones included antenna (hand and fixed ones) and receiver ($AVMLA_{12}$ 3 wave band, monitoring 30 animals at the same time). To locate the position of the sable the methods of radio-tracking was triangulation. GPS was based on American satellite system which costs 1 000 million dollars. If this system composed of 24 satellites which were 20 000 km far from the earth was finished, it would remove the earth in two circles every day.

Because the climate in Daxing'an Mountains was special, we separated a year into four periods: Spring (5-6), Summer (7-8), Autumn (9-10), Winter (11-4).

The method of sampling:

Random plot

By system sample squared method, the sample was distributed over 333 m×1 000 m. The concrete doing: Set some lines in the distance of 1 000 m according to the area's latitude. Then by the line set a plot every other 333 m and made every plot's square over the radio-tracking area.

Radio-tracking plot:

After GPS located the habitat's site by radio-tracking, at every site we set a plot covering 78.5 m^2 within a radius of 5 m. So we could measure a series of factors.

Definition and measure of habitat factors

By the feature sable selected the habitat and the habitat factors used by foreigners when researching American sable, we selected the following habitat factors to definite and measure.

(1) Dominant arbor (solitary tree in the height of 3 m): If the dominant shrub was the tree that make up over 70 percent of the sample, we separated the trees into five types: a. *Xingan* larch superiority; b. birch superiority; c. other single tree species superiority; d. mixed type (no one over 70 percent); e. no tree.

(2) Dominant shrubs (0.5~3 m in height): If the dominant shrub was someone that its cover degree made up over 70 percent of the all, we also separated all the shrubs into five types: *Pinus*; *.Rhodo dendron dauricum*; other single species; mixed type; no shrub.

(3) Crown's cover-degree (the arbor): Divided the sample into same four parts. Then measured differently and calculated the average .We can separated them into five degrees: a) 0%~5%; b) 6%~25%; c) 36%~50%; d) 51%~75%; e) 76%~100%.

(4) Shrub's cover-degree (crown's): The methods of measure and grade were same as those we mention above (crown's cover-degree).

(5) Aspect of slope: a. southern slope; b. southeast slope; c. Northwest slope; d. western slope; e. southwest slope; f. northern slope; g. Northeast lope; h. eastern slope. They were measured by compass.

(6) Slope position: a. upper degree; b. middle degree; c. lower degree.

(7) Density of little trees: It was that in the sample there were how many little arbors whose diameter were less than 10cm.

(8) Density of big trees: It was that in the sample there were how many big arbors whose diameter were over 10 cm.

(9) DBH of big trees: Measured every big tree's DBH, including birch, larch and others.

(10) Slope: Measured the slope vertical extending 5m from the sample' s center by compass.

(11) Elevation: Use GPS to measure it.

(12) Log's length: It was the whole length of he log whose middle diameter was over 10 cm in the sample.

(13) Log: Measured the log's middle diameter.

(14) Natural stump: The stumps were those naturally died and whose height was over 2 m and diameter was over 10 cm. Then recorded the quantity and measured them.

(15) Snow depth: Snow depth was separately measured in the crossing of the sample's circle and equal division line. Then calculated the average. In addition, the method of calculating DBH's standard error was standard difference/ n.

Results and discussion

Habitat selection was the main content of this research on wildlife's management. Did simple mathematical statistics to habitat factors and we drew Table 1~3. It stated clearly in spring sable had strong selection to medium cover-degree forested land, but avoided widen ground and especial high cover-degree forest land. On the contrary, they did not like shrub cover-degree. But preferred for dominant trees, slope position and aspect of slop. Especially, sable liked medium and lower slope.

Table 1 indicated that sable had obvious selection to density of little trees, crown's cover-degree, big trees' diameter, log's diameter and density. But it didn't select thick birches. In spring sables had the stronger selection to log's density and crown's cover-degree (40%~60%) and avoided high elevation, lower slope, lower crown's cover-degree and uncovered

forested land. In spring, it lived in masked area and avoided widen area or under snow. So it could evade enemies (Hermanand 1974; Pullairen 1981; Simon 1980; Spencert 1981). We observed that American Sable often rested in masked area.

Table. 1. The statistics of numerical variables in spring

Variable	Random sample				Track sample			
	N	Range	$\bar{X}$	SD	N	Range	$\bar{X}$	SD
Elevation	51	686~994	821.3	68.4	54	764~1060	862.7	64.5
Slope	51	0~42	9.2	4.0	54	0~32	7.6	3.5
Small tree density	51	0~89	20.1	20.6	54	0~81	18.4	32.7
Big tree density	51	0~3	4.6	3.1	54	0~15	4.4	2.5
Larch DBH	51	11.2~44.4	19.6	5.8	54	10.2~65.0	23.2	6.5
Pine DBH	51	11.1~31.0	16.1	4.5	54	10.0~32.0	16.2	6.2
Log length	51	0~3184	390.0	164.0	54	0~3862	690.6	12.0
Log diameter	51	11~39	18.5	6.2	54	11~54	26.7	10.0
Log density	51	0~5	0.5	0.7	54	0~6	2.7	2.6
Natural stumps	51	0~2	0.4	0.3	54	0~2	0.4	0.5
Cut stumps	51	0~3	0.2	0.4	54	0~2	0.4	0.3
Birch DBH standard error	51	0.4~6.4	1.5	1.2	54	0~6.5	2.3	1.7
Larch DBH standard error	51	0.28~16	2.9	3.0	54	0~23	3.6	3.9

Sables liked to live in primitive forest and especially liked big diameter trees and logs. Eighty percent of the plots we tracked were big trees whose diameter were over 20 cm. Average value was between 38 cm and 42 cm. In American Sable preferred for rest near rotted big branches (Spencer 1981). Those primitive coniferous trees which had many caves and bags, complex structure of late period succession coniferous trees, cover-degree formed by different age trees meeting the needs of sables (Verner and Boss 1980; Zielinski 1981).

Tabel. 2. The checking graph of the obvious difference χ^2 of random plot and sables' using plot factors in Spring

Variable	X^2	*d.f.*	*P*
Small tree density	15.59	2	0.0001
Big tree density	21.47	2	0.0003
Arbor DBH	22.14	2	0.0001
Birch DBH	2.50	2	0.42
Larch DBH	14.54	2	0.0016
Log length	16.04	2	0.0007
Log diameter	15.78	2	0.0004
Log density	24.56	2	0.0001
Superiors arbor	12.50	4	0.03
Superiors shrub	6.58	4	0.42
Aspect of slope	6.86	7	0.44
Slope position	15.60	4	0.008
Crown cover-degree	28.60	4	0.001
Shrubs cover-degree	7.96	4	0.086
Birch DBH standard error	4.40	2	0.24
Larch DBH standard error	12.30	2	0.07

Table 3. The statistics of categorical variables of sables in Spring

Category	Class	Random sample		Trail sample	
		Size	%	Size	%
Dominant tree	1	24	47.0	32	59.3
	2	13	25.5	6	11.1
	3	6	11.8	6	11.1
	4	4	7.8	4	7.4
	5	4	7.8	6	11.1
Dominant shrub	1	13	25.5	16	29.6
	2	17	33.3	20	37.0
	3	14	27.5	9	16.7
	4	3	5.9	6	11.1
	5	4	7.8	3	5.6
Slope aspect	1	3	5.9	4	7.4
	2	4	7.8	5	9.3
	3	9	17.0	10	18.5
	4	11	21.6	11	20.4
	5	10	19.6	9	16.7
	6	5	9.8	4	7.4
	7	6	11.6	7	1.3
	8	3	5.9	4	7.4
Slope position	1	15	28.4	9	16.7
	2	18	35.3	21	38.9
	3	18	35.3	24	44.4
Tree canopy	1	12	23.5	3	5.6
	2	16	31.4	21	38.9
	3	11	21.6	18	33.3
	4	10	19.6	10	18.5
	5	2	3.9	2	3.7
Shrub canopy	1	13	25.5	2	3.7
	2	15	29.4	17	31.5
	3	12	23.5	18	33.3
	4	9	17.6	16	39.6
	5	2	3.9	1	1.9

References

Clark, T. M and Campell, T. M. 1976. Population organization and regulatory mechanisms of pine martens in Grand Teton National park, Wyoming. In: Proc. 1st conf. on scientific research in the nation parks, New Orleans, L9 293~295

Bakeyev, N. and Sinitsyn, A. 1994. Status and conservation of sables in the Commonwealth of Independent States. in: Buskirk, S. W., *et al.* eds. Martens, Sables, and Fishers biology and conservation. 246~255. Ithaca, New York: Cornell University press, 484.

Buskirk, S. W. 1984. Seasonal use of resting sites by marten in south-central Alaska. J. Wild Manage., **48**(3): 305~313.

Gao, Y. T. 1987 Chinese Fauna (Carnivore). Beijing: Science and technology press. 178~182

Grinnel, J., Dixon J. S. and Linsdale, J. M. 1937. Fur bearing mammals of California. Vol. I. Berkley: Vniv. Calif. Press. 777

Koehler, G. M. and Hornocker, M. G. 1977. Fire effects on marten habitat in the Selway-Bitterroot Wilderness. J. Wildl. Manage, **41**: 500~505

Liu Fuyuan. 1989. The Changes of sable distributing region in Daxinganling mountains. Territory and Natural Resources Study, **4**: 61~62

Ma Wenzhong. 1985. Wild sable biological traits (I). Natural Resources Study, **4**: 73~80

Ma Wenzhong. 1986. Wild sable biological traits (II). Natural Resources Study, **3**: 72~79

Ma Yiqing. 1986. Mammals of Heilongjiang province. Harbin: Heilongjiang Scientific Press. 141~149

Ma Yiqing. 1995. Russia sable artificial reproducing and releasing undertakings. Territory and Natural Resources Study, **3**: 77~80

Ma Yiqing and Li Xu. 1994. Distribution and conservation of sables in China. 255~261. in: Buskirk, S. W., *et al.* eds. Martens, Sables and fishers biology and conservation. Ithaca, New York: Cornell University press, 484

Ma Yiqing and Wu Jiayan. 1981. Systematic Review of Chinese Sable, With Description of a New Subspecies Acta Zoologica Sinica, **27**(2): 189~196

Raine. R. M. 1983. Winter habitat use and responses to snow cover fisher (*Martes pennenti*) and marten (*Martes america*) in southeastern Manitoba Can. J. Zool., **61**:15~34

Schempf, P. F. and White, M. 1977. Status of six fur-bear populations in the mountains of northern California USDA Forest Service Region 5, San Francisco Calif. 51

Simon, T. 1980. An ecological study of the marten in the Tahve National Forest. California. M. S. Thesis, California State Univ. Sacrarnento. 107

Soutiere, E. C. 1979. Effects of timber harvesting of Marten in Maine. J. Wildl. Manage., **43**(4):850~860.

Spencer, W. D. 1981. Pine marten habitat preferences sagehen creek. California. Unpubl. M. S. thesis. Univ. California. Berkeley. 121

Tong Yuren. 1981. The natural conservation of sables biological traits. Wild Life **1**:37~40

Tong Yuren and Qian Guocheng. 1990. Complete guides of Chinese fur bears' raising technology. Changchun: Agriculture Science and Technology Press. pp440~475

Tong Yuren, Song Jianhua, Men Taoyan, *et al.* 1993. Studies on Change of Serum Progesterone Level of Sables in Pregnancy Period. Acta Theriologica Sinica, **13**(1): 21~24

Verner. J. and Boss, A. S. 1980. California wildlife and their habitats. Western sierra, Nevada U. S., Dep. Agric. For. Serv. Pacific, Southwest For and range Exp. stn., Berkeley, California 439